ditions of men each a specialist in his own particular department of science; and if it is found that doctors disagree on points of detail, it is claimed that an examination of their views will have the beneficial effect of making the student think for himself instead of merely taking what is written for granted. The mere learning machine, who is frequently devoid of powers of clear exposition, probably exists in every country, but he is not the kind of man to be encouraged. This volume consists of articles on science, by Émile Picard; pure mathematics, by Jules Tannéry; mechanics, by P. Painlevé; general physics, by H. Bouasse; chemistry, by A. Job; morphology, by A. Giard; physiology, by F. Le Dantec; medical sciences, by Pierre Delbet; psychology, by Th. Ribot; sociology and social science, by E. Durkheim; morale, by L. Lévy Bruhl; and history, by G. Monod, all under the editorship of Dr. P. F. Thomas.

(4) Prof. Volkmann's pamphlet is an address delivered at the graduation ceremony of the Albertus University on Jaauary 18. It deals with the materialistic philosophy of the nineteenth century, with phenomenology and monism, and with the idealism of Kant, whose connection with the university in question is too well known to require mention.

(5) Dr. Naber deals in a pleasant and chatty way with many points in the history of Greek and Egyptian geometry. The discussion is in no way confined to the proposition now more generally known as "One Forty-Seven," which forms the title of the book, but we have sections dealing with "Pi" and its supposed value $\sqrt{10}$, with spirals and limaçons and their applications to angle-trisection and cube-duplication, with the history of the "Golden" or median section, and finally with the "pentalpha," or pentagonal star, and the dodecahedron. "Spirals in nature and in art" receive considerable attention, and are illustrated by numerous figures. It would be impossible to dwell at length on the historic side of the book. If it has one fault, that fault is a certain diffuseness and lack of definiteness. By this we mean that in some places it is not very certain what conclusions the author is seeking to prove. But possibly that is because the author is endeavouring to give a general idea of what mathematical thought was like in the Pythagorean times, and to do this he reasons largely from conjecture where historic evidence is wanting. He cannot certainly be accused of being long-winded, his sections being very short and concise, and his language terse.

(6) "To save appearances" (*σωζειν τα φαινομενα* or to account for observed facts was the object of Greek philosophy, which forms the motto of Prof. Duhem's book. Not less is it the object of the modern physicist. In tracing the development of physics from the time of Plato to that of Galileo a good many points may be observed which have left their traces on modern physical theory. We notice, in Prof. Duhem's words, that where we now speak of physics, the Greek and Mussulman philosophers and the men of science of the Middle Age spoke of astronomy; that the laws of motion of celestial bodies were studied ages before anyone thought of applying similar methods to terrestrial (or "sublunary") bodies; that the first discussions of the phenomena of the material world were metaphysical, and that optics and statics were the earliest subjects to form the basis of mathematical theories. We observe with interest the division of physics into two branches, one dealing with celestial and the other with sublunary bodies, of which the first was regarded as infinitely more perfect than the second, and was for this reason wrongly supposed to be only accessible to divine intelligence, while the latter or terrestrial physics was supposed to be summed up in the work of Aristotle. And we reflect that even nowadays the once supposed easier task of "saving the phenomena" of sublunary matter is the one which physicists as a rule shirk. It is true that electricity and not astronomy is the subject now usually under investigation, but in either case the philosopher turns his thoughts to the ether as the seat of the phenomena under investigation, and finds that the hypotheses necessary to "save" these phenomena are greatly simplified owing to the omission of irreversible effects. It is not claimed by Prof. Duhem that his is the first attempt at a history of physics as distinct from mathematics, but as a general account of the subject in a moderate compass it would be difficult to write a better book.

(7) Prof. Gino Loria's book needs little comment. Its merits can be summed up in a few words. It is a book with which no geometer can afford to dispense. It is a bibliography of geometry classified under such headings as "Geometry up to 1850," "Algebraic Curves," "Differential Geometry," "Non-Euclidian Geometry," "Geometry of Multi-dimensional Space." Every page is filled with references, and the number of papers and memoirs which have been consulted in the preparation of the book must be counted by thousands; indeed, if we mistake not, the mere names of authors contained in the index number well into the four figures. The second edition appeared in 1896, and in this third edition the author has added an appendix of about 120 pages dealing with the progress of geometry during the last ten years. In the epilogue, the author compares geometry to a fertile region the vegetation of which still offers numerous prizes in the form of flowers and fruits to the explorer and cultivator. If this analogy be pursued a little further, the need had arisen for a flora of the new territory, and no better botanist could be found for the purpose than Prof. Gino Loria.

THE FLUIDS OF THE BODY IN HEALTH AND DISEASE.

(1) *The Mercers' Company Lectures on the Fluids of the Body.* By Prof. Ernest H. Starling, F.R.S. Pp. viii + 186. (London: Archibald Constable and Co., Ltd., 1909.) Price 6*s.* net.

(2) *Studies on Immunisation and their Application to the Diagnosis and Treatment of Bacterial Infections.* By Sir A. E. Wright, F.R.S. Pp. xv + 490. (London: Archibald Constable and Co., Ltd., 1909.) Price 16*s.* net.

ALL important as the cells and cellular tissues of the body are, the fluids of the body may claim an equal importance, both in physiological or normal

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and in pathological or abnormal processes. In fact the one is a supplement to the other, and probably neither is able to exert its full activity without the simultaneous cooperation of the other.

(1) The first book under review comprises courses of lectures delivered by Prof. Starling at University College under the auspices of the Mercers' Company, at the Bellevue Hospital, New York, under the foundation of Dr. Herter, and at the Royal College of Surgeons. It is written in a simple and attractive style, and gives an admirable description of such subjects as the physical properties of protoplasm, the osmotic relationships of cells, the intake, exchange, absorption, and output of fluids in the body, and the production of lymph (the fluid which bathes the tissues), and the relationship of these normal processes to disease processes, such as dropsy. Many important physical and chemical conceptions, such as osmotic pressure, adsorption, the nature of colloids, surface tension, and the like, are here brought together and explained, and their relation to vital processes is examined. In the discussions of the connection between normal and pathological processes many suggestions of value to the medical practitioner are made. Thus the regeneration of the constituents of the blood after bleeding is considered to be due to the stimulus of lack of oxygen, and the value of occasional blood-letting is compared to that of a sojourn at high altitudes, the beneficial and recuperative effects of which are well recognised, and it is suggested that the practice of *occasional* blood-letting may be restored to the position of honour it once held in medical practice.

(2) The second book includes numerous papers contributed by Sir Almroth Wright, his co-workers, and friends to various journals and societies, and deals more or less directly with the problems of immunisation against disease-producing micro-organisms. The first part of the book deals primarily with the protective elements of the blood, agglutinins, bactericidins, and opsonins; in the second part the problem of fighting bacterial infections by those defensive agencies which the organism itself employs when it contends with microbic invasions, is discussed. The formation of a book by a collection of separate papers, collated together though they be to some extent by numerous foot-notes, necessarily leads to a certain amount of repetition, and to a somewhat irritating use of cross-references. Nevertheless, all workers in this field of research cannot but be grateful to Sir Almroth Wright for thus bringing together and rendering accessible a number of scattered papers.

Opsonins and vaccine therapy necessarily occupy a prominent place. Opsonins are substances present in the blood which act upon invading microbes, and render these susceptible to phagocytosis, that is, to ingestion by certain amœboid, wandering, and other cells, which brings about their destruction. By the injection of a certain quantum of a killed bacterial culture the production of opsonins specific for the particular organism injected tends to be increased; phagocytosis of the organism in question therefore is also rendered more active, and if an infection with the organism exists, it tends to be got rid of. The use of bacterial vaccines has been successful or useful in many infections; this is vaccine therapy. The present-day employment of vaccine therapy must in the main be ascribed to the work of Sir Almroth Wright, his co-workers and pupils, and to them all honour is due. At the same time we cannot help thinking that to some extent a balanced perspective is wanting in some of the statements. Thus the condemnations of the antiseptic system, and of the value of surgical extirpation of infective foci, are too wide and sweeping (pp. 280 and 318). The same criticism applies to the remarks on serum therapy (pp. 300 and 321).

Whatever be the failures of serum therapy, we cannot help thinking that neutralisation of the existing "poison" *at the moment* is a goal to be aimed at, however much we strive to reinforce the defensive powers of the body and render it later able to take care of itself. In very acute infections, such as some forms of septicæmia, which may prove fatal in twenty-four to forty-eight hours, or in cholera, in which the patient may be dead in a few hours after the commencement of the attack, the direct neutralisation of the "poison" would seem to be the only treatment that affords hope of success. The comparative failure of serum therapy should therefore be a stimulus to the elaboration of new methods of preparation of therapeutic serums rather than an argument for considering serum therapy futile.

TEXT-BOOKS OF PHYSICS.

(1) *Heat and other Forces.* By Colonel W. F. Badgley. Part i.: "Heat"; part ii.: "Physical Forces." Pp. 221+vi. (London: King, Sell and Olding, Ltd., 1907.) Price 5*s.* net.

(2) *An Elementary Course in Practical Science.* By C. Foxcraft and T. Samuel. Part i. Pp. 48. Part ii. Pp. 58. (London: G. Philip and Son, Ltd., n.d.) Price 6*d.* net each.

(3) *Horbare, Sichtbare, Elektrische und Rontgen-Strahlen.* By Dr. Friedrich Neesen. Pp. 132. (Leipzig: Quelle and Meyer, 1909.) Price 1.25 marks.

(4) *An Elementary Text-book of Physics.* By Dr. R. W. Stewart. Part ii.: "Sound," pp. iii+141. Part iii.: "Light," pp. vii+219. (London: C. Griffin and Co., Ltd., 1909.) Price, part ii., 2*s.* 6*d.* net; part iii., 3*s.* 6*d.* net.

(1) COLONEL BADGLEY'S book is an extraordinary production. The contents might be guessed from the title, which implies that heat is a force. The author has evidently read a great deal of current scientific work, to which he frequently refers, but has not the exact knowledge necessary for writing on the subject. Indeed, he suggests that the differences between work, energy, power, force, and motion are only mythical, and that the terms are really interchangeable. Typical, also, is the statement that "the heat given off by the spontaneous decomposition of radium is, perhaps, about a degree and a half centigrade." The preface is very cynical. It is questioned whether men of science believe in one

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